Two Cases of an Implantation of a Permanent Pacemaker Using a Transaxillary Incision

Jae-Hoon Choi, MD,1 Jun Kim, MD,1 Tae Ik Park, MD,1 Hyung Ha Jang, MD,1 Tae Kun Lee, MD,1 Sang-Kwon Lee, MD,1 Han Cheol Lee, MD,1 June Hong Kim, MD,1 Kook Jin Chun, MD,1 Taek Jong Hong, MD,1 and Yung Woo Shin, MD,1
1Departments of Internal Medicine and 2Thoracic and Cardiovascular Surgery, Pusan National University School of Medicine, Pusan National University Hospital, Busan, Korea

ABSTRACT

In surgeries that require the implantation of a pacemaker, the endocardial pacemaker leads are introduced into the cardiac chambers through subclavian or axillary venous catheterization or cephalic vein cutdown. The drawback of this type of surgery is scarring of the pectoral area, which can be a serious cosmetic problem especially for young women. In this study, we report on 2 cases where a permanent pacemaker in two young women with symptomatic bradycardia was implanted using a transaxillary incision. Both patients successfully recovered with no complications and were asymptomatic for more than 17 months after the procedure. Therefore, we found that implantation of a pacemaker via transaxillary incision provided excellent cosmetic results and should be considered in young women that require this type of surgery. (Korean Circ J 2008;38:500-504)

KEY WORDS: Pacemaker; Axilla.

Introduction

In surgeries that require the implantation of a pacemaker, the endocardial pacemaker leads are positioned in the cardiac chambers transvenously through a subclavian approach or cephalic vein cutdown in patients that do not need or have intracardiac shunts or tricuspid prosthetic valves. An axillary venous approach for lead placement, which is guided by venography or ultrasonography, is widely used to minimize the risk of lead fracture. In addition to complications related to the implantation of the pacemaker (dislodgment, fracture and infection of leads), this type of surgery can also lead to scarring of the pectoral area, which is a serious cosmetic problem particularly in young women. In this study, we report on the implantation of a permanent pacemaker using a transaxillary incision in two young women with symptomatic bradycardia.

Case

Case 1

A 29-year-old female was referred to the emergency room for a syncope evaluation. She had a history of pulmonary tuberculosis. She also had fever and general myalgia for 5 days. Her physical examination was unremarkable except the appearance of a right cervical lymphadenopathy. A 12-lead electrogram showed sinus rhythm and alternating bundle branch block (Fig. 1). In addition, a high-grade atrioventricular (AV) block was observed (Fig. 2). To address this medical condition a temporary transvenous pacemaker was inserted into the patient. The AV block was resolved 7 days later and the temporary pacemaker was removed. During the patient’s hospital stay (11 days after admission), the patient experienced a loss of consciousness that was accompanied by seizure–like motion and an electrocardiogram showed an intermittent high-grade AV block (Fig. 3). However, there was no evidence of recurrent myocarditis. In addition, the ergonovine provocation coronary angiography was negative. The endomyocardial biopsy revealed the presence of degenerated myocardium with mild infiltration of lymphocytes without granuloma. The cardiac electrophysiological study was negative except for a prolonged HV interval (65 ms). A permanent pacemaker was implanted because she developed a high-grade AV block.
during the recovery phase without a recurrence of myocarditis. We suggested transaxillary implantation of the pacemaker because she was concerned about scarring. Before operating the patient was explained the potential risks and benefits of this procedure.

After obtaining informed consent, the pacemaker was implanted under sedation and analgesia with midazolam and fentanyl. An aseptic drape was placed over the an-

Fig. 1. Twelve-lead electrocardiogram showing a sinus rhythm and an alternating bundle branch block (Left bundle branch block (○) and right bundle branch block (↑)).

Fig. 2. Electrocardiographic findings of case 1. Electrocardiograms (aVF, V1 and V2 leads) showing a sinus rhythm with complete blockage of the right bundle branch, followed by type-II second-degree AV block and a long duration of ventricular asystole (A). A high-grade AV block that was spontaneously resolved (B).

Fig. 3. Electrocardiographic findings of case 1 eleven days after presentation. Electrocardiogram showing a type-II second-degree AV blockage with a long ventricular asystole (A and B) accompanied by seizure-like motions of the patient.
terior chest, left axilla and upper arm. Two guidewires were inserted separately into the left axillary vein under venographic guidance.

An incision was made beneath the lateral border of the pectoralis major muscle. Adipose tissue under the incision site was dissected and the pectoralis major and minor muscle was bluntly separated to create a pocket for the pacemaker generator.

The guidewire that was inserted over the chest wall was redirected into the pocket. Endocardial leads were then inserted and positioned in the right atrial appendage and in the right ventricular apex using the standard method with acceptable sensing and pacing threshold. A layer-by-layer suture of subcutaneous tissue was carried out after placement of the generator, which was connected to the lead. After implantation, a chest X ray was taken (Fig. 4A and B) and the scar was invisible (Fig. 4C and D).

The total procedural time was 180 min. The excisional biopsy of the cervical lymph nodes showed chronic granulomatous inflammation. She was discharged and took anti-tuberculosis drugs for 9 months. She remained free of symptoms and AV blockage through the entire 20-month follow-up period.

Case 2

A 21-year-old female visited the hospital for evaluation of recurrent syncope, dizziness and palpitation for several months. The first episode of syncope happened 3 months previously while the patient was working on a computer. The physical examination was unremarkable except for the presence of bradycardia. A 12-lead electrocardiogram showed sinus bradycardia; the heart rate was 30 beats/min (bpm) and the QT interval was prolonged (QT, 664 msec, QTc, 469 msec) (Fig. 5). Twenty-four hour Holter monitoring showed torsades de pointes (Fig. 6). Blood tests (including serum electrolytes) were within the normal limits.

Prior to procedure, the potential benefits and risks of transaxillary implantation of the pacemaker were discussed with the patient and her family. After obtaining informed consent, the pacemaker was implanted with the same transaxillary approach discussed in case 1. Endocardial leads were inserted and positioned in the right atrial appendage and in the right ventricular apex with the standard method with acceptable sensing and pacing threshold. AV block was noted at MR prob. The total procedural time was 140 minutes. After implantation, a chest X-ray was taken (Fig. 7A and B) and the scar was

---

Fig. 4. Images of case 1 after pacemaker implantation. The chest X-ray showed that the leads were appropriately implanted without any complications (A and B). The pacemaker pocket wound is along the anterior axillary line (C and D).

Fig. 5. Twelve-lead electrocardiogram of case 2 showing sinus bradycardia.
invisible (Fig. 7C and D). She was discharged one week after insertion of the pacemaker. The patient remained asymptomatic with no recurrence of syncope of torsades de pointes through the entire 17-month follow-up period.

Discussion

In surgeries that require the implantation of a pacemaker, endocardial pacing leads are inserted into the cardiac chambers through subclavian puncture or by cut-down of the cephalic vein. Cardiologists typically prefer subclavian puncture to surgical cutdown of the cephalic vein because the approach is easy and advanced surgical skills are not required. An axillary venous approach that is guided by venography or ultrasonography is widely used because the subclavian venous approach carries the risk of lead conductor and insulation fracture. Leads are very rarely implanted through the femoral vein or iliac vein.

Implantation of a permanent pacemaker is done mainly in the elderly, but in rare cases it is required in young patients with complete congenital AV blockage and familial sick sinus syndrome. Implantable cardioverter defibrillators (ICDs) are mostly implanted in elderly patients with prior myocardial infarction or ischemic heart disease in western countries, but young adults with Brugada syndrome comprise a significant proportion of the ICD treatment group in Korea.
As a result of the surgical scarring, physicians should pay attention to the cosmetic concerns of young women undergoing implantation of a cardiac rhythm device. Shefer recently reported on 17 cases where retropectoral transaxillary permanent pacemakers were transplanted. In addition to the surgical approach presented here, inframammary placement of the generator has also been shown to minimize scarring on the upper chest. However, the transaxillary approach, which also produces excellent cosmetic results, has an advantage since this technique does not require deep sedation or general anesthesia. In addition, the shorter distance between the venous access site and pocket makes tunneling easier when compared with the inframammary approach. Furthermore, in the transaxillary approach the two most important adjacent structures (the axillary artery and the brachial plexus) can be avoided.

In addition to the cosmetic advantage, the placement of the pulse generator under the pectoralis major muscle eliminates the potential risk of skin erosion, particularly in patients with minimal subcutaneous adipose tissue. Separation of the major and minor pectoralis muscle via a transaxillary incision carries a minimal risk of bleeding when compared with the standard subpectoral pocket generation, which is primarily used for large devices or in patients at high risk of skin erosion.

In case 1 it was debatable if a pacemaker was required, since she developed paroxysmal high-grade AV block during the recovery phase of myocarditis (not during the active phase). However, the risk of future symptomatic AV blockage was assessed as high; therefore, the pacemaker was implanted. Regarding the cause of the AV blockage in case 1, cardiac sarcoidosis should be considered on the grounds that granulomatous cervical lymphadenopathy, pulmonary lesion and AV block were observed in this patient. A positive result for Mycobacteria (using polymerase chain reaction), improvement of lymphadenopathy after administration of antituberculous medication, a negative endocardial biopsy for granuloma, an evolutionary change in the electrocardiogram, and an elevation of cardiac enzymes all support a diagnosis of myocarditis with separate tuberculous lymphadenopathy rather than sarcoidosis involving the heart and lymph nodes.

In this study we have reported on two cases where the permanent implantation of a pacemaker using a transaxillary incision in young women resulted in minimal scarring. Therefore, the transaxillary percutaneous technique should be considered in young women who do not want a scar on the upper chest or in patients with minimal subcutaneous tissue, which are at a high risk for skin erosion after implantation of a pacemaker or defibrillator.

REFERENCES